Next Generation
Vehicle and
Infrastructure
Wireless
Communications

Virginia Tech
Transportation Institute

Research Basics

The Virginia Tech Transportation Institute’s (VTTI) wireless communications mission is to identify emerging wireless communications technology to support transportation specific applications. In addition, researchers work to identify and scientifically assess these technologies, which include as vehicle- and infrastructure-based connectivity and Department of Transportation Operations.

Wireless communications technology is developing at an incredibly rapid pace through advancements in government-sponsored research and consumer electronics development.

Many of these technologies are directly applicable to a transportation setting yet are not often researched from this perspective. VTTI’s long history of transportation research, combined with Virginia Tech’s world-class wireless communications research center, Wireless @ Virginia Tech (http://wireless.vt.edu/), enables us to uniquely identify and apply emerging technologies to meet the safety, mobility and operational needs to the United States Department of Transportation (U.S. DOT) and state DOTs.

VTTI has developed a flexible, adaptable wireless communications testbed on our one-of-a-kind controlled highway facility, the Virginia Smart Road. The Smart Road is a 2.2-mile testbed located at VTTI and built to Federal highway standards.

This ‘technology agnostic’, open architecture platform provides the fundamental infrastructure to investigate technologies in a transportation specific setting.

The Smart Road provides a venue that simulates a real-world highway intersection environment yet also provides a safe and controlled venue filling the void between simulation/bench testing and live deployment.

In concert with the Smart Road controlled test bed, VTTI researchers utilize connected intersection nodes within the live transportation infrastructure of the towns of Blacksburg and Christiansburg, Virginia.

VTTI researchers have successfully deployed and demonstrated safety and mobility technologies such as Dedicated Short-Range Communications (DSRC) to support collision avoidance and highway-based wireless mesh networks interfaced with mobil-IP vehicle-based wireless routers.

Research Topics

- Outdoor wireless deployment optimization
- Metric development for assessing mobile networks, handoff, latency, and configuration optimizations
- Software defined radios to foster interoperability and flexibility
- Situational aware cognitive radios that observe the spectrum/data environment, adapt and learn
- Emerging technologies such as Femto Cellular base stations andWhitespace Devices
- Green wireless communications
- Advanced networking for distributed computing and Mobile Ad Hoc Networks (MANET)
- Advanced Radio Frequency Identification (RFID), Radio Frequency (RF) integrated circuits, communications and Digital Signal Processing (DSP), and large-scale wireless simulation.